

REMARKS

Claims 51-52 and 54-55 are cancelled. Claim 60-63 are added. Claims 12-13, 16, 21-23, 47-50, 53 and 56-63 are pending in the application.

Claims 51-58 are allowable. Claims 51-52 and 54-55 are rewritten as independent claims 60-63, respectively, to include the limitations of their respective independent claims. Accordingly, new independent claims 60-63 are allowable and dependent claims 51-52 and 54-55 are cancelled. Please note that original claim 55 recited "prior to the unevenly removing." Such language has been amended to recite "prior to the etching" for clarification.

Claims 12, 13, 16, 21-23, 53 stand rejected under the obviousness-type double patenting over U.S. Patent no. 6,309,973. Claims 48-50 and 56-58 stand rejected under the obviousness-type double patenting over U.S. Patent no. 6,309,973 in view of Fazan et al. (U.S. Patent no. 5,597,756). A terminal disclaimer is filed herewith and overcomes the rejections. Withdrawal of both obviousness-type double patenting rejections is requested.

Claim 59 stands rejected under 35 USC §112, first and second paragraphs, and would be allowable if the §112 rejections are overcome. Claims 12, 13, 16, 21-23 and 47 stand rejected under 35 USC §103 as being unpatentable over Crotti (U.S. Patent No. 4,957,881). Claims 48-50 stand rejected under 35 USC §103(a) as being unpatentable over Crotti and further in view of Fazan et al. (U.S. Patent No. 5,597,756).

Claim 59 stands rejected under 35 USC §112, first paragraph, as containing subject matter which allegedly is not described in the specification in

such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention (pg. 2 of paper no. 3). The Examiner states that Applicant has not shown where in the specification a teaching exists to side surfaces of a conductive material defining a maximum width of an outer portion of the conductive material within an opening (pg. 2 of Paper No. 3). The Applicant presents the following reference to the originally-filed application where the teaching to such limitation exists.

The Examiner is respectfully reminded that the MPEP addresses guidelines for the examination of applications under 35 USC §112, first paragraph, and states that it is well accepted that a satisfactory description may be in any portion of the originally-filed specification and Applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means such as **words, structures, figures**, diagrams, and formulas that fully set forth the claimed invention. MPEP §2163(I), citing to *Lockwood vs. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (Fed. Cir. 1997).

Claim 59 recites forming conductive material within the opening over the node location, the conductive material comprising an outer portion received elevationally outward of the insulated conductive lines, the conductive material having side surfaces which project away from the node location and terminate proximate an upper surface, the side surfaces and upper surface defining at least one corner region, the side surfaces defining a maximum width of the outer

portion of the conductive material within the opening. Figs. 8-10 and associated description of such Figs. in the originally-filed specification (pgs. 7-8) teach one exemplary embodiment of the recited limitations of claim 59 as the following reference to pages and reference numerals demonstrate. A conductive material 72 comprises an outer portion (intersecting side surfaces 76 and upper surfaces 74 described at the first paragraph of page 8) received elevationally outward of the insulated conductive lines 46 (see Fig. 8), the conductive material 72 having side surfaces 76 which project away from a node location 56 (see Fig. 8) and terminate proximate an upper surface side 74. The side surfaces and upper surface 76, 74 (first para., page 8) defining at least one corner region, the side surfaces 76 defining a maximum width of the outer portion of the conductive material 72 within the opening. The outer portion as defined in claim 59 is clearly shown to define the maximum width of the conductive material 72. Accordingly, pursuant to the above MPEP authority, the elements of claim 59 are clearly shown in the originally-filed application which includes the specification and drawings, and therefore, meet the guidelines of §112, first paragraph. The §112, first paragraph rejection against claim 59 is inappropriate and should be withdrawn.

Moreover, claim 59 stands rejected under 35 USC §112, second paragraph as being indefinite for failing to point out and distinctly claim the subject matter which Applicant regards as his invention. First, the Examiner states that the maximum width of the conductive plug would have only one value and depends on the size of the opening in which the plug is formed (pg. 2 of paper no. 3).

The Examiner alleges since no maximum size of the opening is described in the specification, it is unclear what the maximum value would be (pg. 2 of paper no. 3). Second, the Examiner states that since the opening could be varied, the maximum width (of the plug) is a relative term and could have different values. Based on these two reasons, the Examiner alleges the maximum width is vague and indefinite (pg. 2 of paper no. 3). Applicant disagrees.

The crux of the Examiner reasoning is that without a precise value, the maximum width is vague. MPEP §2173.05(b) states that the fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite under 35 USC §112, second paragraph. Citing to *Seattle Box Co., vs. Industrial Crating and Packing, Inc.*, 731 F.2d, 818, 221, USPQ 568 (Fed. Cir. 1984). Acceptability of claim language depends on whether one of ordinary skill in the art would understand what is claimed in light of the specification.

However, a precise value of the maximum width is not relevant to the claim language of claim 59 since the claim is not claiming any precise value of a maximum width, but the structure which defines the maximum width of the claimed conductive material. Claim 59 recites the conductive material comprising an outer portion received elevationally outward of the insulated conductive lines, the conductive material having side surfaces which project away from the node location and terminate proximate an upper surface, the side surfaces and upper surface defining at least one corner region, the side surfaces defining a maximum width of the outer portion of the conductive material within the opening.

One skilled in the art would understand the claim language without a precise value and the location of the maximum width relative to other widths of the conductive material structure. Every three-dimensional object has a maximum width whether precisely stated or not, and the location of such maximum width can be stated with definiteness without referring to a precise value. Accordingly, reciting to or pointing to a teaching of a precise value for a maximum width is not needed to make claim 59 definite. Claim 59 is understood by one skilled in the art and definite as written, and therefore, the rejection under §112, second paragraph is improper and should be withdrawn. Applicant respectfully requests withdrawal of both §112 rejections against claim 59 in the next Office Action.

Claim 12 recites unevenly removing material from the first uppermost surface of the conductive plug without using masking material to define an uneven second uppermost surface. Crotti teaches forming a matrix metal layer 7 and etching such layer 7 using residues of planarized SOG (spin-on-glass) material 8 defined along the bottom of valleys of the previously deposited layer 7 wherein the *SOG material 8 is used as an etch mask* (Figs. 5-6; col. 3, Ins. 15-59). In no fair or reasonable interpretation does Crotti teach or suggest unevenly removing material from the first uppermost surface of the conductive plug without using masking material as recited in claim 12 inasmuch as SOG material 8 is utilized as a mask. Crotti fails to teach or suggest a positively recited limitation of claim 12, and therefore, the obviousness rejection is overcome. Applicant respectfully requests allowance of claim 12 in the next Office Action.

Claims 13 and 16 depend from independent claim 12, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are neither shown or taught by the art of record.

Claim 21 recites beveling at least one corner of a conductive plug formed over a diffusion region. Crotti teaches forming a matrix metal layer 7 having valleys and peaks (col. 2, Ins. 65-68 and col. 3, Ins. 1-10; Figs. 4-5). In no fair or reasonable interpretation does Crotti teach at least one corner of a conductive plug as recited in claim 21. Accordingly, claim 21 recites a positively recited limitation of claim 21, and therefore, for at least this reason, claim 21 is allowable.

Moreover, Crotti fails to teach beveling at least one corner of a conductive plug as recited in claim 21. Crotti teaches removing peaks formed in matrix metal layer 7 (Fig. 5-6; col. 3, Ins. 36-59). Since a corner is not taught by Crotti, it is inconceivable that Crotti teaches beveling at least one corner. Accordingly, in no fair interpretation does Crotti teach beveling at least one corner of a conductive plug as recited in claim 21. In fact, Crotti explicitly teaches etching the metallic material of the matrix layer 7 is conducted for a time sufficient to lower the etching edge of the matrix layer 7 down to an intermediate level down the flank of the spacer 6 as depicted in Fig. 6 (col. 3, Ins. 52-59). As depicted in Fig. 6 of Crotti, such teaches removing a peak that is laterally outward of the subsequently formed contact metal structure shown in Fig. 8-9, and therefore, in no reasonable interpretation does Crotti teach or

suggest beveling at least one corner of a conductive plug as recited in claim 21. Accordingly, Crotti fails to teach or suggest another positively recited limitation of claim 21, and for this additional reason, claim 21 is allowable. For either reason expressed above regarding claim 21, the obviousness rejection against claim 21 fails. Applicant respectfully requests allowance of claim 21 in the next Office Action.

Claims 47 and 53 depend from independent claim 21, and therefore, are allowable for the reasons discussed above with respect to the independent claim as well as for their own recited features which are neither shown or taught by the art of record.

Claim 22 recites forming a conductive plug over a substrate node location between a pair of conductive lines and having a width terminating over respective conductive lines of the pair of conductive lines. Crotti teaches contact metal structure or riser 7 having lateral edges between sidewall spacers 6 of gatelines 4 and 5 (Figs. 6-9). In no reasonable or fair interpretation does Crotti teach or suggest forming a conductive plug having a width terminating over respective conductive lines of the pair of conductive lines as recited in claim 22. Accordingly, Crotti fails to teach or suggest a positively recited limitation of claim 22, and therefore, claim 22 is allowable. Applicant respectfully requests allowance of claim 22 in the next Office Action.

Claim 23 depends from independent claim 22, and therefore, is allowable for the reasons discussed above with respect to the independent claim, as well

as for its own recited features which are neither shown or taught by the art of record.

Claim 48 recites forming a pair of spaced and adjacent conductive contact projections over a substrate, the conductive contact projections having respective widths, and etching at least one of the conductive contact projections effective to reduce its width. Claim 48 stands rejected under the combination of Crotti and Fazan. The combination fails to teach the recited limitation of claim 48.

The only teaching of Crotti forming a contact metal structure 7 showing a width is depicted in Figs. 6-9. However, Crotti fails to teach or suggest etching a contact metal structure 7 to reduce its width. In no reasonable or fair interpretation does Crotti suggest or teach etching at least one of the conductive contact projections effective to reduce its width as recited in claim 48. Additionally, Fazan only teaches forming contact openings 17B in a base dielectric layer 16 and filling the openings with conductive material to form contact plugs 18A and 18B (col. 3, lns. 43-50). The reference is devoid of etching the contact plugs. Therefore, in no reasonable or fair interpretation does Fazan suggest or teach etching at least one of the conductive contact projections effective to reduce its width as recited in claim 48. Therefore, Fazan also fails to teach or suggest the positively recited limitation of claim 48 not shown or suggested in Crotti. Accordingly, it is inconceivable that any combination of Crotti and Fazan could teach or suggest forming a pair of spaced and adjacent conductive contact projections having respective widths and etching at least one of the conductive contact projections effective to reduce its width as recited in


claim 48. Therefore, the combination of Crotti and Fanzan fails to teach a positively recited limitation of claim 48, and therefore, the obviousness rejection must fail. Applicant respectfully requests allowance of claim 48 in the next Office Action.

Claims 49-50 and 56-58 depend from independent claim 48, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are neither shown or taught by the art of record.

This application is now believed to be in immediate condition for allowance, and action to that end is respectfully requested. If the Examiner's next anticipated action is to be anything other than a Notice of Allowance, the undersigned respectfully requests a telephone interview prior to issuance of any such subsequent action.

Respectfully submitted,

Dated: 4-22-02

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 09/909,111
Filing Date July 18, 2001
Inventor Mark Fischer
Assignee Micron Technology, Inc.
Group Art Unit 1765
Examiner Duy Vu Deo
Attorney's Docket No. MI22-1777
Title: Semiconductor Processing Methods of Forming a Conductive Projection and Methods
of Increasing Alignment Tolerances

VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING
RESPONSE TO DECEMBER 21, 2001 OFFICE ACTION

In the Claims

The claims have been amended as follows. Underlines indicate insertions and
~~strikeouts~~ indicate deletions.

Please cancel claims 51-52 and 54-55.

12. (Amended) A method of forming DRAM circuitry comprising:
forming a conductive plug over a substrate node location between a pair of conductive
lines and with which electrical communication with a bit line is desired, the conductive plug
having a first uppermost surface; and
unevenly removing material the first uppermost surface of the conductive plug without
using masking material to define an uneven second uppermost surface at least a portion of
which is disposed elevationally higher than the conductive lines and to reduce a width of the
conductive plug from what it was prior to said unevenly removing.

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22. (Amended) A method of forming DRAM circuitry comprising:
forming a conductive plug over a substrate node location between a pair of conductive lines and with which electrical communication with a bit line is desired, the conductive plug having a first uppermost surface having a generally uniform surface and having a width terminating over respective conductive lines of the pair of conductive lines; and

etching material of the conductive plug to define a second uppermost surface which is generally non-planar and at least a portion of which is disposed elevationally higher than the conductive lines and to reduce the width of the conductive plug.

Please add the following new claims:

New Claims

60. (New) A method of forming DRAM circuitry comprising:
forming a conductive plug over a substrate node location between a pair of conductive lines and with which electrical communication with a bit line is desired, the conductive plug having a first uppermost surface;

unevenly removing material from the first uppermost surface of the conductive plug to define an uneven second uppermost surface at least a portion of which is disposed elevationally higher than the conductive lines and to reduce a width of the conductive plug from what it was prior to said unevenly removing; and

wherein the unevenly removing comprises removing material of the conductive plug from an entirety of the uppermost surface.

61. (New) A method of forming DRAM circuitry comprising:

forming a conductive plug over a substrate node location between a pair of conductive lines and with which electrical communication with a bit line is desired, the conductive plug having a first uppermost surface;

unevenly removing material from the first uppermost surface of the conductive plug to define an uneven second uppermost surface at least a portion of which is disposed elevationally higher than the conductive lines and to reduce a width of the conductive plug from what it was prior to said unevenly removing; and

wherein the uppermost surface is substantially planar immediately prior to the unevenly removing.

62. (New) A method of forming DRAM circuitry comprising:

forming a conductive plug over a substrate node location between a pair of conductive lines and with which electrical communication with a bit line is desired, the conductive plug having a first uppermost surface having a generally uniform surface and having a width;

etching material of the conductive plug to define a second uppermost surface which is generally non-planar and at least a portion of which is disposed elevationally higher than the conductive lines and to reduce the width of the conductive plug; and

wherein the etching etches material of the conductive plug from an entirety of the uppermost surface.

63. (New) A method of forming DRAM circuitry comprising:

forming a conductive plug over a substrate node location between a pair of conductive lines and with which electrical communication with a bit line is desired, the conductive plug having a first uppermost surface having a generally uniform surface and having a width;

etching material of the conductive plug to define a second uppermost surface which is generally non-planar and at least a portion of which is disposed elevationally higher than the conductive lines and to reduce the width of the conductive plug; and

wherein the uppermost surface is substantially planar immediately prior to the etching.

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